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• Autio, Erkki

**Oulu Fin-90560 (FI)**

• Keskitalo, Liikka

**Oulu Fin-90240 (FI)**

• Kinnunen Pasi

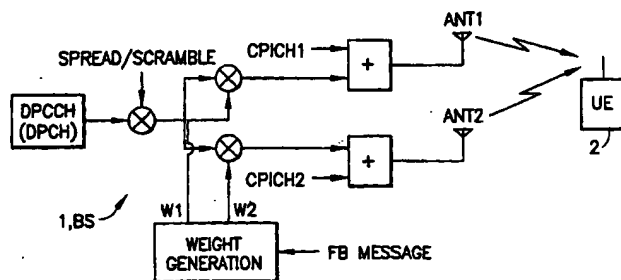
**Oulu Fin-90240 (FI)**(30) Priority: **26.09.2000 US 669746**(71) Applicant: **Nokia Corporation****02150 Espoo (FI)**(74) Representative: **Slingsby, Philip Roy et al****Page White & Farrer****54 Doughty Street****London WC1N 2LS (GB)**

(72) Inventors:

• **PAJUKOSKI, KARI****Oulu Fin 90240 (FI)**(54) **Antenna phase estimation algorithm for WCDMA closed loop transmitter antenna diversity system**

(57) This invention teaches a method for use in a wideband CDMA telecommunications system wherein the base station (BS) utilizes transmit antenna diversity. The method enables the user equipment (UE) to perform a channel estimate for channels received from two antennas of the base station (BS), and includes steps of: (a) computing an estimated phase difference between a common pilot channel and a dedicated pilot channel received from one antenna of the two antennas; and (b) determining the channel estimate by rotating a common pilot channel estimate according to the estimated phase difference, where the phase difference is computed as a complex coefficient between the com-

mon pilot channel and the dedicated pilot channel. In a second aspect this invention teaches a method for use in a transmit antenna diversity system for enabling the UE to verify an antenna phase shift previously signaled by the UE to the BS. This method includes a first step of: (a) exploiting prior knowledge of BS rotation angle by considering a vector  $\underline{x}$  that includes all hypotheses for complex rotation coefficients of the BS with respect to all possible rotation angles, in accordance with a decision rule for an estimation of a complex rotation coefficient. A second step of the method evaluates a cost function of a hypothesis  $m$  by considering the prior knowledge.



**FIG.1A**  
PRIOR ART



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# EUROPEAN SEARCH REPORT

Application Number  
EP 01 30 8008

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
P, X	EP 1 133 072 A (MATSUSHITA ELECTRIC IND CO LTD) 12 September 2001 (2001-09-12)	1-3	H04L25/02 H04B7/06
P, A	* paragraphs '0026! - '0044! * * figures 4,5 * * abstract * * claims 1,5,6 *	10-12	
A	EP 0 964 529 A (MATSUSHITA ELECTRIC IND CO LTD) 15 December 1999 (1999-12-15) * paragraph '0017! *	1,3,10	
A	EP 1 001 558 A (MATSUSHITA ELECTRIC IND CO LTD) 17 May 2000 (2000-05-17) * abstract *	1,3,10	
A	HOTTINEN A ET AL: "Transmit diversity using filtered feedback weights in the FDD/WCDMA system" BROADBAND COMMUNICATIONS, 2000. PROCEEDINGS. 2000 INTERNATIONAL ZURICH SEMINAR ON ZURICH, SWITZERLAND 15-17 FEB. 2000, PISCATAWAY, NJ, USA, IEEE, US, 15 February 2000 (2000-02-15), pages 15-21, XP010376432 ISBN: 0-7803-5977-1 * the whole document *	4-9	TECHNICAL FIELDS SEARCHED (Int.Cl.7) H04B H04L
A	"3GPP RAN S1.14 V2.0.0, UTRA FDD; physical layer procedures, Chapter 8 Feedback mode transmit diversity-" 3GPP RAN S1.14 V2.0.0, XX, XX, April 1999 (1999-04), pages 1-32, XP002184716 * page 25 *	4-9	
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		14 January 2005	Yang, Y
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	



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Application Number

EP 01 30 8008

### CLAIMS INCURRING FEES

The present European patent application comprised at the time of filing more than ten claims.

- ☐ Only part of the claims have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims and for those claims for which claims fees have been paid, namely claim(s):
- ☐ No claims fees have been paid within the prescribed time limit. The present European search report has been drawn up for the first ten claims.

### LACK OF UNITY OF INVENTION

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

see sheet B

- ☒ All further search fees have been paid within the fixed time limit. The present European search report has been drawn up for all claims.
- ☐ As all searchable claims could be searched without effort justifying an additional fee, the Search Division did not invite payment of any additional fee.
- ☐ Only part of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the inventions in respect of which search fees have been paid, namely claims:
- ☐ None of the further search fees have been paid within the fixed time limit. The present European search report has been drawn up for those parts of the European patent application which relate to the invention first mentioned in the claims, namely claims:



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LACK OF UNITY OF INVENTION  
SHEET B

Application Number  
EP 01 30 8008

The Search Division considers that the present European patent application does not comply with the requirements of unity of invention and relates to several inventions or groups of inventions, namely:

1. claims: 1-3 10-12

This first group is related to a method for enabling a user equipment in an antenna diversity system to perform a channel estimate for a channel received from a base station.

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2. claims: 4-9

This second group is related to a method for enabling a user equipment in a transmit antenna diversity system to verify an antenna phase shift previously signaled by the user equipment to a base station.

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**ANNEX TO THE EUROPEAN SEARCH REPORT  
ON EUROPEAN PATENT APPLICATION NO.**

EP 01 30 8008

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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14-01-2005

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